

Patent Application of
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for
AIR-POWERED PROJECTILE LAUNCHER

CROSS-REFERENCES TO RELATED APPLICATIONS

Not Applicable.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not Applicable.

MICROFICHE APPENDIX

Not Applicable

BACKGROUND OF THE INVENTION

1. Field of the Invention.

This invention relates to the field of small projectile launchers. More specifically, the invention comprises an air-powered launcher capable of individually feeding and shooting pliable objects such as marshmallows and foam ear plugs.

2. Description of the Related Art.

Small projectile launchers have long been known as novelty items. These launchers typically fire potatoes, vegetable slices, marshmallows, tennis balls, and the like. Some are spring loaded, while others use pistons to compress a charge of air. They typically fire a small projectile which can be used in "mock combat" games without actually injuring the target. These devices have also found application other than as novelty items. Some have been used to fire marking projectiles in the veterinary and timber industries. Others have been used as pill injectors for treating horses and cows. Thus, although such projectile launchers are most often viewed as novelty items, their applications may be much broader.

BRIEF SUMMARY OF THE PRESENT INVENTION

The present invention comprises an air-powered projectile launcher. A double-acting piston within a pump tube is employed. A separate magazine tube is used to hold a plurality of projectiles. One end of the magazine tube feeds into a barrel assembly. The opposite end is closed by a one-way valve. The muzzle of the barrel is closed by a muzzle valve. When the piston is pulled through a back stroke, an air manifold directs the flow to induce a vacuum in the end of the magazine tube

proximate the barrel. The vacuum closes the muzzle valve and opens the one way valve on the opposite end of the magazine tube. The vacuum then pulls the first projectile into the barrel.

When the piston is pushed through a forward stroke, pressure is directed behind the first projectile and in front of the second projectile. The second projectile is forced back into the magazine tube. The pressure within the magazine tube closes the one way valve, effectively making the second projectile the base of a closed firing chamber. As the piston continues through its forward stroke, the first projectile is forced through the barrel. The muzzle valve flies open and the first projectile shoots out at substantial velocity. The piston is then ready for a new back stroke, which repeats the cycle.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. 1 is a perspective hidden line view, showing the present invention .

FIG. 2 is an exploded detail view, showing how the barrel mounts to the manifold.

FIG. 3 is a section view, showing the barrel's internal details.

FIG. 4 is a section view, showing some internal passages.

FIG. 5 is a hidden line detail view, showing the connections to the piston.

FIG. 6 is a hidden line perspective view, showing the location of the one way valve.

FIG. 7 is a detail view, showing the loading of the magazine.

FIG. 8 is a section view, showing the firing cycle.

FIG. 9 is a section view, showing the firing cycle.

FIG. 10 is a section view, showing the firing cycle.

FIG. 11 is a perspective view, showing a variant having a detachable magazine.

FIG. 12 is a perspective view, showing the detachable magazine in more detail.

FIG. 13 is a perspective view with a section, showing how the magazine sealer can be detached from the magazine tube.

FIG. 14 is a section view, showing the internal details of the detachable magazine version.

REFERENCE NUMERALS IN THE DRAWINGS

10	projectile gun	12	magazine tube
14	pump tube	16	slide
18	cross pin	20	pin slot
22	tube bracket	24	handle
26	manifold	28	barrel assembly
30	muzzle	32	muzzle valve
34	bore	36	breach receiver
38	piston	40	connecting rod
42	magazine outlet	44	one-way valve
46	barrel	48	breach plug
50	throat	52	air hole
54	feeding cone	56	pressure chamber
58	feeding tube	60	sealing ring
62	valve slot	64	follower
66	vent	68	feed plenum
70	projectile	72	first projectile

74	second projectile	76	retaining clip
78	detachable magazine	80	magazine sealer
82	magazine receiver	84	one piece barrel
86	sealing ring		

DETAILED DESCRIPTION OF THE INVENTION

FIG. 1 shows a hidden line view of projectile gun 10. Magazine tube 12 and pump tube 14 are held in position by manifold 26 and tube bracket 22. Slide 16 slide forward and backward along pump tube 14. Cross pin 18 - which is connected to an internal piston, rests within pin slot 20. Pin slot 20 limits the forward and backward travel of slide 16.

Handle 24 is provided on the lower portion of tube bracket 22. Barrel assembly 28 is attached to manifold 26. Muzzle 30 is regulated by muzzle valve 32. The projectiles to be fired by the device are stored in magazine tube 12. The user charges the device by pulling slide 16 to its rearward limit. When the user then pushes slide 16 forward, a projectile will be expelled from muzzle 30. Each cycling of slide 16 loads and fires a single projectile.

FIG. 2 shows barrel assembly 28 removed from manifold 26 and in an exploded state. Breach plug 48 fits into breach receiver 36, with sealing ring 60 forming an airtight seal. The forward end of magazine tube is open (magazine outlet 42). Barrel 46 threads onto the forward portion of breach plug 48. Muzzle valve 32 is pivotally mounted to barrel 46.

FIG. 3 is a section view through breach plug 48 and barrel 46 (with the two components being assembled). Referring to both FIGs. 2 and 3, magazine outlet 42 fits inside breach plug 48, adjacent to feeding cone 54. The projectiles are fed through this assembly from right to left in the view as shown. Feeding cone 54 narrows to feeding tube 58. Feeding tube 58 leads into pressure chamber 56. Pressure chamber 56, in turn, leads to throat 50. Bore 34 is connected to throat 50.

The two components are threaded together, though the actual method of joiner is not significant. A series of radially spaced air holes 52 pass through breach plug 48. These apply pressure and vacuum forces to pressure chamber 56, as will be described subsequently. Valve slot 62 is provided to attach muzzle valve 32.

FIG. 4 is a section view through the assembled projectile gun. The reader will observe how breach plug 48 fits within manifold 26. The forward end of pump tube 14 is sealed by manifold 26. Vent 66 is cut into the top of pump tube 14, however. Vent 66 feeds into feed plenum 68, a hollow cavity within manifold 28. Returning briefly to FIG. 2, feed plenum 68 is readily visible. Breach plug 48 actually seats against a step-down in the bore through manifold 26 (visible as a ring in FIG. 2). The reader will observe that feed plenum 68 completely surrounds magazine tube 12.

Returning now to FIG. 4, the purpose of air holes 52 will be explained. Piston 38 moves forward and backward within pump tube 14, since it is connected to slide 16. As it moves forward, air is pushed through vent 66 into feed plenum 68. It then flows through air holes 52 and pressurizes pressure chamber 56. The reverse is also true - When piston 38 moves backward, a vacuum is created within pressure chamber 56.

Follower **64** is a free-sliding plug within magazine tube **12**. The rearward end of magazine tube **12** is closed by a one-way valve which allows air to flow into, but not out of, the rear of magazine tube **12**.

FIG. 5 illustrates the connections between slide **16** and piston **38**. Piston **38** is attached to connecting rod **40**. Connecting rod **40** is pierced by a transverse hole, as is slide **16**. Cross pin **18** is located in the transverse hole through connecting rod **40** and slide **16**. It is retained via friction, adhesive, clips, or other known devices. Cross pin **18**, as mentioned previously, also rests within pin slot **20**. Thus, when the user grasps slide **16** and moves it forward or backward, piston **38** will move likewise.

FIG. 6 shows a rear view of projectile gun **10**. Tube bracket **22** is used to mount one-way valve **44**, which closes off the rear end of magazine tube **12**.

FIGs. 7-10 illustrate the operation of the device. In FIG. 7, barrel assembly **28** has been removed to expose magazine outlet **42**. One or more projectiles **70** are pushed into magazine outlet **42** and into magazine tube **12**. Projectiles **70** should be somewhat pliable. Small marshmallows and foam ear plugs are good examples of suitable projectiles.

Once the desired number of projectiles has been loaded, the user replaces barrel assembly **28** as shown in FIG. 8. Barrel assembly **28** may be fitted by simply pressing it into manifold **26** (conventional latching features may also be used to retain it). Follower **64** lies to the rear of projectiles **70** within magazine tube **12**.

To prepare the device for firing, the user first grabs slide **16** and pulls it rearward. FIG. 9 shows this action, with piston **38** nearing the end of its rearward stroke. A vacuum is created within the forward portion of pump tube **14**. This vacuum is carried through vent **66**, feed plenum **68**, air

holes 52, and into pressure chamber 56. The vacuum pulls muzzle valve 32 closed. One-way valve 44, in the rear of magazine tube 12 opens to admit air into the magazine tube, behind follower 64. Follower 64 then moves forward, pushing the projectiles along, until first projectile 72 is lodged in throat 50 (It is stopped by the narrowing diameter of throat 50). Second projectile 74 rests within feeding tube 58.

FIG. 10 shows the forward stroke of piston 38. High pressure is created within pressure chamber 56. This pressure forces second projectile 74 back into feeding tube 58 (using all the remaining projectiles against follower 64). One-way valve 44 will not allow air to escape from the rear of magazine tube 12. Thus, the remaining projectiles and follower 64 effectively become a rearward wall of pressure chamber 56. Since the pressure has nowhere else to go, first projectile 72 is compressed into throat 50 and down bore 34. Air compression in front of first projectile 72 opens muzzle valve 32. First projectile 72 then shoots out at considerable velocity.

Once piston 38 reaches the forward limit of its stroke, the cycle is set to repeat. When the piston is again cycled rearward, the configuration shown in FIG. 9 will recur. Thus, those skilled in the art will realize that each cycle of the piston, shoots one of the projectiles in magazine tube 12.

The loading process illustrated in FIG. 7 is effective but not very rapid. Some users may desire the immediate reloading of a full magazine. FIG. 11 depicts a variant including a detachable magazine. Manifold 26 is modified to include magazine receiver 82. Detachable magazine 78 includes magazine sealer 80 affixed to its forward extreme. Detachable magazine 78 is loaded with projectiles. A follower 64 and one-way valve 44 are also provided.

To reload the device, the user presses the forward end of detachable magazine 78 into magazine receiver 82 and rotates the rearward end down into retaining clips 76 provided on the top

of tube bracket 22. Magazine sealer 80 provides an airtight seal with manifold 26. The internal passages and connections within manifold 26 may be the same as illustrated previously, though the dimensions will vary to accommodate the addition of magazine sealer 80.

Thus, to reload the weapon, the user attaches detachable magazine 78. The user may need to cycle slide 16 to advance the first projectile to firing position. The user then fires the device normally. Several detachable magazines 78 can be carried for quick reloading.

Although the preceding descriptions contain significant detail they should not be viewed as limiting the invention but rather as providing examples of the preferred embodiments of the invention. As one example, vent 66 could be configured to feed directly into pressure chamber 56 rather than through feed plenum 68. The principles governing the operation of the device would be the same. FIGs. 12-14 depict this variation (also including the use of a detachable magazine and a one-piece barrel assembly). FIG. 12 shows detachable magazine 78 in more detail. It includes a feed tube with one way valve 44 closing one end. Magazine sealer 80 is removably mounted on the opposite end. Magazine sealer 80 includes a pliable sealing ring 86, which seals the assembly to magazine receiver 82 in manifold 26.

In order to allow quick loading of detachable magazine 78, magazine sealer 80 is detachable. FIG. 13 shows the assembly with magazine sealer 80 detached. Magazine outlet 42 is exposed for rapid loading. Magazine sealer 80 is sectioned in the view to allow the visualization of its internal features. The reader will observe that it includes internal features previously found in breach plug 48 (feeding cone 54 and feeding tube 58).

FIG. 14 shows detachable magazine 78 in position within the projectile launcher, with a section through the assembly to expose the internal details. Breach plug 48 has been eliminated.

Vent 66 feeds directly into the area immediately behind one piece barrel 84 (pressure chamber 56). The linear progression through feeding cone 54, feeding tube 58, pressure chamber 56, throat 50, and bore 34 is the same as for the previously disclosed embodiments. Thus, the function of feeding and firing the projectiles is identical. However, the device has been simplified. It also permits the use of a detachable magazine.

Those skilled in the art will realize that many such structural variations are possible without altering the operating principles of the invention. Accordingly, the scope of the invention should be determined by the following claims, rather than the examples given.